

AP Biology: Cellular Communication

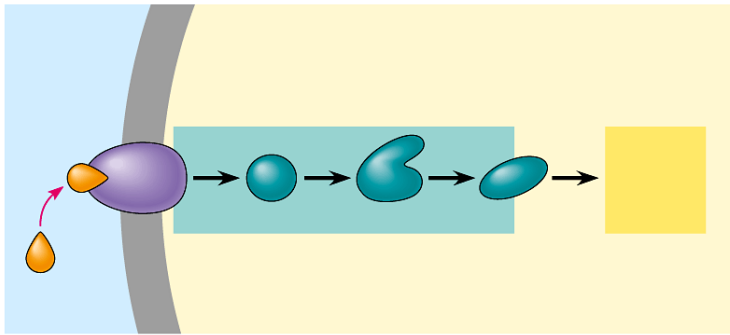
Figures referenced from Campbell, 6th ed.

TYPES OF SIGNALING

- direct contact (cell to cell recognition, gap junctions)...what types of cells would use these examples?
- paracrine signaling (local only...example: growth factors)
- synaptic signaling (neurons only)
- endocrine signaling (long distances...hormones)

THREE STAGES OF A SIGNAL-TRANSDUCTION CASCADE

1. Reception- signal molecule (ligand) binding to receptor
2. Transduction- usually a change in shape, getting signal into form that can illicit response
3. Response

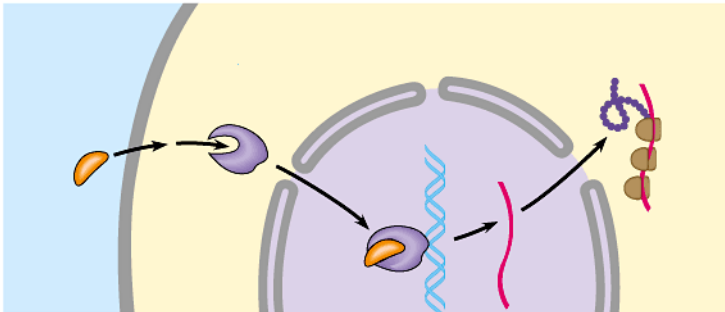


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MECHANISMS OF CELL SIGNALING

Intracellular Receptors (fig 11.10)

- characteristics: polar or nonpolar?
- operating procedures (activation)
- examples: steroid hormones, enzymes, gene regulation
 - eventually (directly or indirectly) effect transcription or translation, turning genes “on” or “off”



Cell Surface Receptors (fig 11.5)

-characteristics: polar or nonpolar?

-operating procedures

1- chemically gated ion channels (fig 11.9)

-like synapses

2- enzymatic receptors often protein kinase (tyrosine-kinase) (fig 11.8)

-advantage: often have multiple binding sites (each can initiate a different process or up the rate of a process)

3- G-protein linked receptors (fig 11.7): *UTSW Nobel for G Protein mechanism*

-named 'cuz has binding site for G protein (role of GTP)

-a G protein is a "diffusible signal in the cytoplasm"; however, they still stay near the cell surface and usually activate a cell surface enzyme

-GTP = short lifespan (why is this good?)

-thought that 50-60% of all medicines use G protein pathways

-have identified more than 100 G-linked proteins!!

-phosphorylation cascades (fig 11.11)- *note: protein kinases add PO_4^{3-} , protein phosphatases remove PO_4^{3-}*

4-use of 2nd messengers (non proteins!!) (fig 11.15)

-once we are more intracellular (farther from cell surface where the G linked receptors are located) we use water soluble 2nd messengers

-most common examples (btw: look at structure, why are they water soluble?)

-cAMP

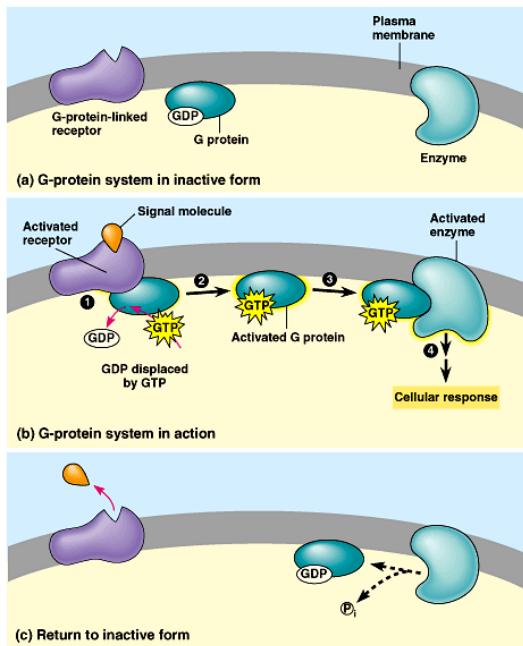
- Ca^{2+}

-Why all the steps?

-amplification of signals (biological cascades) (fig 11.16)

-specificity, each step is a "yes/no" or "go/stop" decision (fig 11.18)

-scaffolding proteins (keeps 'em close)



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